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by

Robert Ram



1877

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Historical Sketch

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The First Water Works in America.

HISTORICAL SKETCH OF THE BETHLEHEM WATER WORKS.

BY ROBERT RAU.

In Bethlehem Town Council, Monday night, Mr. Rau member from the First Ward, who, in conjunction with Burgess Becket, had been appointed a Committee to compile statistics of the Bethlehem Water Works, reported as follows:

The Committee appointed at a late meeting of Council for compiling statistics of, and matters pertaining to, the Bethlehem Water Works, presents the accompanying report; and, while this may seem, perhaps, to be more explicit and particular than absolutely required for its specific intent, the Committee feels that no apology need be tendered on this account; not at least to any who are interested in the history of the early attempts at such municipal improvements and their gradual development into a more perfect system of hydraulics. We may, too, take a special interest in this matter when we take into consideration, perhaps with a little justifiable pride, that we have here to treat of the first water works of the State, indeed, we have reason to believe, the first in the country. The Committee therefore regards it as being eminently proper that all possibly attainable facts should be thus gathered from reliable sources and rescued from the fate of tradition, which would be us unfortunate almost as oblivion itself.

The spring, pouring its sparkling tide from out its bed of magnesian limestone, near the banks of the "Menagassi," is to-day, and has been, ever since the Moravian Brethren, in March of 1741, made them an humble home in the trackless forests, the source of water supply for Bethlehem. Situated at the foot of the hill, upon the declivity of which the first log cabin was erected by

the zealous missionary pioneers, it doubtless determined to a great extent the location of the slowly growing settlement. Until 1754 the water for the use of the community was distributed by water carriers or haulers, formally delegated for the purpose; from among the names of these Aquarii, a faithful chronicler of old time events* has preserved the following: Godfrey Haberecht, who first filled the office and who was appointed in July of 1742; — Schnall, of whom it is recorded that in the discharge of his duties he had the mishap to upset his cart and fracture his arm; Peter Peterson; — Hussey, in 1748, and after him — Wittke, the last of the incumbents.

In September of 1751, we find the name of Hans Christopher Christiansen upon the list of newly arrived settlers.

This man, subsequently proving to be so valuable an addition to the colony, was born near Hadersleben, in Holstein, then under Danish rule, was by profession a millwright and by nature a mechanical genius. To the inventive ability of this ingenious Dane it was left to devise a method of supplying the community with water from the spring, by means otherwise than distributing it by water carriers. In the Spring of 1754 Christiansen commenced the erection of the first water works. The machinery was placed in a frame building 19x22, a few yards east of the oil and bark mill, whither the spring water was led, by a conduit, into a cistern. The pump was made of lignum vitæ, the cylinder being five inches in diameter.† The water was forced through wooden pipes, up the hill into a wooden reservoir or distributing tank, built within

* The late Rev. Wm. C. Reichel, to whose patient researches many of the following facts and figures are gratefully credited.

† According to the specific statement of Charles David Bishop, whose father, John David Bishop, was apprenticed to the Danish millwright, Hans Christopher Christiansen, and who subsequently, as well as his son Charles David, and later, his grandson, Gilbert Bishop, had the care of the water works intrusted to him. To the kindness of Mr. Gilbert Bishop are due many important data herein stated.

the "little square"—the place now occupied by the Moravian church—being a perpendicular height of 70 feet. These pipes were bored hemlock logs which had been floated down the "west branch of ye Delaware," as the old accounts here term the Lehigh, from Gnadenhuetten, on the Mahoning, an Indian mission, near the site of Lehighton, in Carbon county.

The arrangements were sufficiently advanced by June 20th of the same year to admit of a trial, and on that evening the water was thrown in a jet—"as high as the adjoining houses." The event created great gratification in the little community, and the novelty of the enterprise invariably excited the wonder and admiration of visitors.

It is to be deplored that a more specific account of these first water works is not to be obtained, yet so much can be inferred from the succinct statements of the chroniclers above referred to that many interruptions and disappointments were caused by the bursting of the wooden mains. There was subsequently made, but with no better result, an attempt to substitute 1½ inch lead pipes, which were made of sheet metal, soldered along the edges and imbedded in a cement of pitch and brick dust, laid in a gutter, of hard burnt brick.

Being convinced of the incompleteness of his work and of the possibility of improving upon this, his first attempt, Christiansen commenced, in 1761, the construction of more powerful machinery, such as might meet the wants of the now evidently growing settlement, and this, moreover, in pursuance to a plan perfected by himself, John Arbo and

— Marshal.

A two-story building 22x80 was erected for the reception of the works, a little to the south of the frame building. This house, well preserved, is still standing and bears evident traces upon its door posts and window frames of the fire which, on the 18th of November, 1763, destroyed the original oil mill, a wooden structure across the way.

After the lapse of a year, Christiansen reached the completion of his task, and on the 6th of July, 1762, the new pumps raised the water for the first time. Nor were forgotten, amid the general rejoicings of that memorable day, the authors of the achievement, for, as the records quaintly tells us, Christiansen received 80 shillings, and Christopher Demuth, his assistant, 15 shillings "for ye water running."

The machinery of those second water works, which was one of the sights of the town and which never failed to interest visitors, consisted of (quoting the description of Charles D. Bishop) 8 single-acting force pumps (of iron, cast at Durham Furnace at a cost there of £8 12s 4d) of 4 inch caliber and 18 inch stroke, worked by a triple crank (forged by the resident blacksmith, Stephen Blum, and ever the just subject of pride as to ingenuity of workmanship) geared to the shaft of an undershot water wheel, 18 feet in diameter and 2 feet clear in the buckets.

The head of water was 2 feet. On the water wheel shaft was a wallower of 83 roands, which geared into a spur wheel of 52 cogs, attached to the crank; the three pi ton rods were attached each to a frame or crosshead working in grooves to give them a motion parallel to the pumps. The crossleads were of wood, as also the parts containing the grooves for guides. The works were calculated to raise the water 70 feet, subsequently however increased to 112 feet. The rising mains were made of gum wood, as they were subject to greater pressure, the other pipes of pitch pine.

The cost of the entire works, including the tile-covered stone building, was £514 16s. 5d.

The distributing reservoir was a *stand-pipe*, a wooden tower, shingle roofed, which was built in "the little square" already mentioned, surmounted, moreover, as sundry expense accounts inform us, with an embellishment in the way of a

weather vane of piscatorial device. From this point the water was 'distributed' into cisterns or tanks which were built in the vicinity of the principal dwellings.¹¹

According to the distinct statement of a well preserved ground plan of "The Bethlehem Water Mains and Connections," dated 1786; but specifying the extensions and changes which were made until 1791, the gum, wood, rising mains were superseded by lead pipes in 1786, as also the pitch-pine conduits on Main street from the corner of Market street to the Sun Tavern. The pitch-pine mains had to be renewed, already, as early as 1769, by a second installment, this time transported hither from the Pocopoco in Monroe county. In 1789 the newly-erected Young Ladies' Seminary building, which stood, willow-enhowered, on the site of the present Moravian Patochial School, was supplied with water directly from the tower, also by lead pipes. At this date, then, the water was delivered into seven, reservoirs from the tower, namely: 1st, to the reservoir still standing in the square on Church street opposite the Widows' House; 2d, to the apothecary's, the present site of Simon Ran & Co.'s stand; 3d, to a wooden tank on Market street, about fifty feet east of Main street; these three cisterns were completed in 1766; 4th, to a cistern at the farm buildings, about the present site of A. H. Ranch & Son's confectionary; 5th, to the Sun Tavern; 6th, to a cistern in the rear of the Brethren's House; the house now known as the central portion of the Young Ladies' Seminary buildings; 7th, to the Seminary in Willow Square. From the reservoir on Church street were laid supply pipes of lead to the church (the present chapel), to the Sisters' House, to the Widows' House, and to the stable a few rods to the east of the Widows' House.

In the yard of the Brethren's House were laid connections to the stable and to the battery in the rear. Branch pipes also conducted the water from the farm-house cistern to the stables and the "milk cellar."

In 1796 the remaining pitch-pine pipes were finally abandoned, and those of lead substituted.

Thus was maintained a very complete system of water delivery, a system which invariably impressed sojourners in Bethlehem, during the early days of the Republic, with astonishment and admiration. Nor were there wanting, among these, men of note who might have inscribed their names upon the register, had but such an one been displayed in that ancient tile-covered pile. For there came in April, 1768, Gov. Penn and his lady, and in May of that year Lord Chas. Montague, Governor of South Carolina. In April, 1774, Baron von Reepsdorf, Governor-General of the Danish West India Islands, on a tour through the British Colonies, visited the works and was presented with a draft of the same by Christiansen. They were viewed, on Sept. 22d, 1777, by John Adams, and on July 25th, 1782, by Gen. Washington and two adjutants.

Shortly after the commencement of the nineteenth century, plans were made by the inhabitants of the village for providing a larger house of worship, which resulted in the erection of the Moravian Church now gracing the "little square" on the corner of Church and Main streets.

In 1803 work was commenced, and one of the preliminary steps was the removal of the buildings then occupying the ground and with them the vane-tipped water tower.

There was, therefore, built a second stand pipe on Market street, a short distance above the terminus of Cedar street, and this time, moreover, the Lehigh Hills furnished the material from out their rich outcrop of Potsdam sandstone.

The contour of the tower was hexagonal and (although reports disagree and documentary evidence is wanting) its height was about 15 feet.

The box inclosed near the summit was 112 feet above the spring, received the supply through lead mains running along Cedar street, and sent forth supply pipes,

also of lead, to the various cisterns then existing. Iron pipes were introduced in 1813, and were of unique construction, being packed at the connections with leather, and joined and tightened with screws or clamps by their flanged ends. To secure storage for an ample reserve of water, in case of accident to the works or of a conflagration, there was built the reservoir in Market street, to the east of the tower, and, according to a memorandum noted by Charles D. Bishop, 70 feet long, 10 wide and 7 deep under the arch, and on the evening of Dec. 20, 1817, the fixtures were completed. In 1832 the triple pumps, after a service of 70 years, were supplanted by the double acting pump of larger dimensions, now yet brought into occasional service, the machinery was placed in the present water works building in that year, and the memorable and ingenious device of Hans Christopher Christiansen became a thing of history.

This new pump, constructed by Russ & Muhlenberg of Philadelphia, is of 5 inch cylinder and 3 feet stroke, and, together with its appurtenances, was placed *in situ* by Charles D. Bishop and the then aged ex superintendent of the works, Ernst Gebe.

The newly-occupied building was known as the second oil mill, and had been built by Christiansen in 1764, and was regarded by him as his masterpiece in the way of millwright achievements.

A reservoir, constructed in 1832, under the supervision of our venerable townsmen, Peter Kleckner, on more elevated ground, north of Broad street, and about 100 feet east of Long alley, led to the removal of the now superfluous water tower.

By an act of Assembly, approved by the Governor of the Commonwealth, Francis R. Shunk, Feb. 24, 1845, was authorized the incorporation of the "Bethlehem Water Company," under whose care and supervision the waters of the spring were distributed uninterruptedly for 26 years, the company, more

over, having resorted to steam power as a pumping agent in 1868.

The Broad street reservoir became useless in 1871, and in the early Spring of that year the water company made overtures to the Borough Council, looking to a sale of the water works and the entire system of supply including a transfer of its chartered rights, for the sum of \$20,300, and the purchase was made in the following May.

Work was at once commenced upon a new reservoir, an iron tank, placed back of North street, east of High street, at a height of 149 feet above the water works, exerting there a pressure of 80 feet to the square inch.

In 1874 the machinery of the works was enlarged and brought to the more perfect state as it now exists. The second steam pump now introduced, consists of a double acting cylinder of 12 inch diameter and 3 feet stroke. It raises 18 gallons of water at each stroke and distributes over 500,000 gallons in 24 hours with the pump making 20 strokes per minute.

The wooden conduit, which had for many years led the waters of the spring a distance of 350 feet to the cistern in the water works building, was superseded by 18 inch iron pipes in 1874.

It seems eminently fit, in conclusion, once more to refer to the spring near the "Menagassi" which has never, since the primitive times of the dispensing Aquarii of 1742 until the present day, failed in the yield of its potable flood. Seasons of uncommon drought have diminished its flow, but then even it is calculated to furnish 777,700 gallons every 24 hours. The water contains carbonate of lime held in solution by free carbonic acid, but no magnesia, although coursing without doubt for a long distance through the magnesian limestone.

This does not by any means detract from its drinkable quality, as is shown by statistics carefully compiled in many of the cities and towns through out Europe with reference to the supply of calcareous drinking waters. Moreover its absolute and remarkable freedom from any organic impurities (which contaminations are becoming more and more recognized as the fruitful source of various zymotic diseases) renders it all the more eminently valuable, and warrants the exercise of the most jealous care in its preservation and distribution.